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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/228,772	01/06/1999	JACOB BENESTY	BENESTY21613	8127

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EXAMINER	
TRAN, CON P	

ART UNIT	PAPER NUMBER
2644	

DATE MAILED: 05/09/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	09/228,772	BENESTY ET AL.
	Examiner	Art Unit
	Con P. Tran	2644

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 January 1999* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-16* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-16* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☒ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Specification

1. The disclosure is objected to because of the following informalities: On page 24, line 10 presently read "a ainst", which is missing one character.

Appropriate correction is required.

Claim Objections

2. Claims 7-10, 13, and 15 are objected to because of the following informalities: Formulas in claims 7-10, 13, and 15 should have notations in order to clarify the invention. Appropriate correction is required.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) do not apply to the examination of this application as the application being examined was not (1) filed on or after November 29, 2000, or (2) voluntarily

published under 35 U.S.C. 122(b). Therefore, this application is examined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

4. **Claims 1-2 and 11-12** are rejected under 35 U.S.C. 102(e) as being anticipated by Romesburg U.S. Patent 6,185,300.

Regarding **claim 1**, Romesburg teaches a robust adaptive filter (430; see col. 16, lines 44-60; see Fig. 4, and respective portions of the specification), comprising:

a fast impulse response filter (450; see col. 12, lines 14-33);

a coefficient vector update device (455) connected to the fast impulse response filter for feeding adaptive coefficients thereto in response to a received error signal (see col. 13, lines 26-57); and

a modifying device for modifying the adaptive coefficients by application of an adaptive scaled non-linearity (i.e., NLP, see MATLAB Script in col. 21-22).

Regarding **claim 2**, Romesburg teaches a robust adaptive filter (430; see col. 16, lines 44-60; see Fig. 4, and respective portions of the specification), comprising:

an adaptive filter utilizing a fast converging adaptive algorithm (see col. 20, line 65 –col. 21, line 14); and

means for modifying the algorithm by the application thereto of an adaptive scaled non-linearity (i.e., NLP, see MATLAB Script in col. 21-22).

Regarding **claim 11**, Romesburg teaches a robust echo canceller (430; see col. 16, lines 44-60; see Fig. 4, and respective portions of the specification) for use in a telephone circuit (see col. 4, lines34-39), comprising:

an adaptive filter connected to the telephone circuit for outputting an error signal corresponding to a detected echo signal (450; see col. 12, lines 14-33);

a vector coefficient update device (455) connected to the filter for feeding adaptive coefficients thereto in response to a modified error signal (see col. 13, lines 26-57); and

a device for modifying the adaptive coefficients by modifying the error signal through the application of an adaptive scaled non-linearity to the error signal to generate the modify error signal (i.e., NLP, see MATLAB Script in col. 21-22).

Regarding **claim 12**, Romesburg further teaches the echo canceller of claim 11, further comprising a double talk detector connected to the telephone circuit for disabling the update device in response to the detection of double talk on the circuit (see col. 5, line 45-47)

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. **Claims 3 and 4** are rejected under 35 U.S.C. 103(a) as being unpatentable over Romesburg U.S. Patent 6,185,300 in view of Duttweiler U.S. Patent 5,951,626

Regarding **claim 3**, Romesburg teaches a filter as claimed in claim 2. However, the Romesburg reference does not explicitly disclose the filter that the fast converging algorithm is PNLMS.

In the same field of endeavor, Duttweiler teaches (see Fig. 1, 2, and respective portions of the specification) an adaptive filter (100) that the fast converging algorithm is PNLMS (see col. 4, lines 15-47) in order to distribute adaptive energy evenly across the tap (see col. 1, lines 53-54).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have included within the Romesburg reference an adaptive filter (100) that the fast converging algorithm is PNLMS (see col. 4, lines 15-47) as taught by Duttweiler since such combination would have distributed adaptive energy evenly across the tap as suggested by Duttweiler in column 1, lines 53-54.

Regarding **claim 4**, the combination of Romesburg and Duttweiler further teaches a filter as claimed in claim 2, wherein the fast converging algorithm is PNLMS++ (see: Romesburg col. 20, line 65 – col. 21, line 14; Duttweiler col. 4, lines 15-47).

7. **Claim 5** is rejected under 35 U.S.C. 103(a) as being unpatentable over Romesburg U.S. Patent 6,185,300 in view of Gay U.S. Patent No. 5,428,562.

Regarding **claim 5**, Romesburg teaches a filter as claimed in claim 2. However, the Romesburg reference does not explicitly disclose the filter that the fast converging algorithm is APA.

In the same field of endeavor, Gay teaches an adaptive filter that the fast converging algorithm is APA (see col. 2, lines 53-65) in order to achieve fast convergence through sample-by-sample updating with low complexity (see col. 1, lines 46-47).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have included within the Romesburg reference an adaptive filter that the fast converging algorithm is APA (see col. 2, lines 53-65) as taught by Gay since such combination would have achieved fast convergence through sample-by-sample updating with low complexity as suggested by Gay in column 1, lines 46-47.

8. **Claim 6** is rejected under 35 U.S.C. 103(a) as being unpatentable over Romesburg U.S. Patent 6,185,300 in view of Oh et al. U.S. Patent 6,137,881.

Regarding **claim 6**, Romesburg teaches a filter as claimed in claim 2. However, the Romesburg reference does not explicitly disclose the filter that the fast converging algorithm is PAPA.

In the same field of endeavor, Oh et al. teaches an adaptive filter that the fast converging algorithm is PAPA (see col. 2, line 47 – col. 3, line 17) in order to improve the numerical stability of the filter algorithm (see col. 1, lines 48-49).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have included within the Romesburg reference an adaptive filter that the fast converging algorithm is PAPA as taught by Oh since such combination would have improved the numerical stability of the filter algorithm as suggested by Oh in column 1, lines 48-49.

9. **Claims 7-8 and 9-10** are rejected under 35 U.S.C. 103(a) as being unpatentable over Romesburg U.S. Patent 6,185,300 in view of Duttweiler U.S. Patent 5,951,626, further in view of Fujii et al. U.S. Patent 5,790,440, and further in view of Kim and Efron ("Adaptive Robust Impulse Noise Filtering," IEEE Transaction on Signal Processing, Vol. 43, No. 8, pp. 1855-1866, August 1995)

Regarding **claim 7**, Romesburg and Duttweiler teach a filter as claimed in claim 2. However, the Romesburg and Duttweiler in combination does not explicitly disclose the adaptive scaled non-linearity is a sign function.

In the same field of endeavor, Fujii et al. teaches an adaptive scaled non-linearity is a sign function (see col. 33, lines 18-38) so that a coefficient adjustment may be maintained without being stopped by the extreme reduction of the coefficient adjusting amounts (see col. 8, lines 57-59).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have included within the Romesburg and Duttweiler an adaptive scaled non-linearity that is a sign function, as taught by Fujii, since such combination would have provided a coefficient adjustment that may be maintained without being stopped by the extreme reduction of the coefficient adjusting amounts as suggested by Fujii in column 8, lines 57-59.

It should be noted that the Romesburg, Duttweiler, and Fujii in combination fails to clearly teaches an adaptive scaled non-linearity that is given by:

$$\Psi\left(\frac{|en|}{s}\right) sign\{e_n\} s_n$$

In the same field of endeavor, Kim and Efron reference teaches an adaptive scaled non-linearity that is given by the above formula (see pp. 1857, right-hand column, paragraph 3 - pp. 1858, right-hand column, paragraph 2) in order to obtain robust power spectral density estimate (see pp. 1866, left-hand column, paragraph 1).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have included within the combination of Romesburg,

Duttweiler, and Fujii an adaptive scaled non-linearity that is given by the above formula as taught by Kim and Efron since such combination would have obtained robust power spectral density estimate as suggested by Kim and Efron on page 1866, left-hand column, paragraph 1.

Regarding **claim 8,** Kim and Efron reference further teaches an adaptive scaled non-linearity (see pp. 1857, right-hand column, paragraph 3 - pp. 1858, right-hand column, paragraph 2) given by:

$$\Psi\left(\frac{|en|}{s}\right) sign\{e_n\} s_n$$

Regarding **claim 9,** Kim and Efron reference further teaches an adaptive scaled non-linearity (see pp. 1857, right-hand column, paragraph 3 - pp. 1858, right-hand column, paragraph 2) given by:

$$\Psi\left(\frac{|en|}{s}\right) sign\{e_n\} s_n$$

Regarding **claim 10,** Kim and Efron reference further teaches an adaptive scaled non-linearity (see pp. 1857, right-hand column, paragraph 3 - pp. 1858, right-hand column, paragraph 2) given by:

$$\Psi\left(\frac{|en|}{s}\right) sign\{e_n\}s_n$$

10. **Claim 13** is rejected under 35 U.S.C. 103(a) as being unpatentable over Romesburg U.S. Patent 6,185,300 in view of Oh, Linebarger, Priest, Raghothaman ("A fast affine projection algorithm for an acoustic echo canceller using a fixed-point DSP processor," ICASSP IEEE Int. Conf. Acoustics, Speech, and Signal Processing, 1997, pp. 4121-4124), further in view of Fujii et al. U.S. Patent 5,790,440, and further in view of Kim and Efron ("Adaptive Robust Impulse Noise Filtering," IEEE Transaction on Signal Processing, Vol. 43, No. 8, pp. 1855-1866, August 1995).

Regarding **claim 13**, Romesburg teaches a robust echo canceller (430; see col. 16, lines 44-60; see Fig. 4, and respective portions of the specification) comprising:

an adaptive filter for outputting an error signal in response to a detected echo signal (450; see col. 12, lines 14-33); and

means for supplying adaptive filter coefficients to the filter (see col. 13, lines 26-57).

However, the Romesburg reference does not explicitly disclose the coefficient update equation in form of:

$$h_{n+1} = h_n + \mu G_n X_n (X_n^T X_n + \delta I),^{-1} e_n$$

In the same field of endeavor, Oh, Linebarger, Priest, Raghothaman reference teaches coefficients given by

$$h_{n+1} \quad = h_n + \mu G_n X_n (X_n{}^T X_n + \delta I),^{-1} e_n$$

(see pp. 4121, right-hand column, paragraph 5 - pp. 4122, right-hand column, paragraph 4) in order to be able to develop an acoustic echo canceller that performs in actual usage (see pp. 4121, right-hand column, paragraph 4).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have included within Romesburg reference the coefficients as taught by Oh, Linebarger, Priest, Raghothaman since such combination would have been able to develop an acoustic echo canceller that performs in actual usage as suggested by Oh, Linebarger, Priest, Raghothaman in pp. 4121, right-hand column, paragraph 4.

However, the Romesburg and Oh, Linebarger, Priest, Raghothaman in combination does not explicitly disclose the adaptive filter coefficients are sign function.

In the same field of endeavor, Fujii et al. teaches an adaptive filter coefficients are a sign function (see col. 33, lines 18-38) so that a coefficient adjustment may be maintained without being stopped by the extreme reduction of the coefficient adjusting amounts (see col. 8, lines 57-59).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have included within the Romesburg and Oh, Linebarger, Priest, Raghothaman an adaptive scaled non-linearity that is a sign function, as taught by Fujii, since such combination would have provided a coefficient

adjustment that may be maintained without being stopped by the extreme reduction of the coefficient adjusting amounts as suggested by Fujii in column 8, lines 57-59.

It should be noted that the Romesburg; Oh, Linebarger, Priest, Raghothaman; and Fujii in combination does not explicit disclose the filter coefficients in forms of:

$$h_{n+1} = h_n + \frac{\mu}{x_n^T} G_{nxn}\varphi(|en|\text{sign}\{e_n\}$$

In the same field of endeavor, Kim and Efron reference teaches an adaptive scaled non-linearity that is given by:

$$h_{n+1} = h_n + \frac{\mu}{x_n^T} G_{nxn}\varphi(|en|\text{sign}\{e_n\}$$

(see pp. 1857, right-hand column, paragraph 3 - pp. 1858, right-hand column, paragraph 2) in order to obtain robust power spectral density estimate (see pp. 1866, left-hand column, paragraph 1).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have included within the combination of Romesburg; Oh, Linebarger, Priest, Raghothaman; and Fujii an adaptive scaled non-linearity that is given by the above formula as taught by Kim and Efron since such combination would have obtained robust power spectral density estimate as suggested by Kim and Efron on page 1866, left-hand column, paragraph 1.

Regarding **claim 14**, Romesburg further teaches the echo canceller of claim 13, further comprising a double talk detector connected to the telephone circuit for disabling

the update device in response to the detection of double talk on the circuit (see col. 5, line 45-47)

Regarding **claim 15**, Romesburg teaches a robust echo canceller (430; see col. 16, lines 44-60; see Fig. 4, and respective portions of the specification) comprising:

an adaptive filter for outputting an error signal in response to a detected echo signal (450; see col. 12, lines 14-33); and

means for supplying adaptive filter coefficients to the filter in element-wise fashion (see col. 13, lines 26-57).

However, the Romesburg reference does not explicitly disclose the coefficient update equation in form of:

$$h_{n+1} \quad = h_n + \mu G_n X_n (X_n^T X_n + \delta I),^{-1} e_n$$

In the same field of endeavor, Oh, Linebarger, Priest, Raghothaman reference teaches coefficients given by

$$h_{n+1} \quad = h_n + \mu G_n X_n (X_n^T X_n + \delta I),^{-1} e_n$$

(see pp. 4121, right-hand column, paragraph 5 - pp. 4122, right-hand column, paragraph 4) in order to be able to develop an acoustic echo canceller that performs in actual usage (see pp. 4121, right-hand column, paragraph 4).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have included within Romesburg reference the coefficients as taught by Oh, Linebarger, Priest, Raghothaman since such combination

would have been able to develop an acoustic echo canceller that performs in actual usage as suggested by Oh, Linebarger, Priest, Raghothaman in pp. 4121, right-hand column, paragraph 4.

However, the Romesburg and Oh, Linebarger, Priest, Raghothaman in combination does not explicitly disclose the adaptive filter coefficients are sign function.

In the same field of endeavor, Fujii et al. teaches an adaptive filter coefficients are a sign function (see col. 33, lines 18-38) so that a coefficient adjustment may be maintained without being stopped by the extreme reduction of the coefficient adjusting amounts (see col. 8, lines 57-59).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have included within the Romesburg and Oh, Linebarger, Priest, Raghothaman an adaptive scaled non-linearity that is a sign function, as taught by Fujii, since such combination would have provided a coefficient adjustment that may be maintained without being stopped by the extreme reduction of the coefficient adjusting amounts as suggested by Fujii in column 8, lines 57-59.

It should be noted that the Romesburg; Oh, Linebarger, Priest, Raghothaman; and Fujii in combination does not explicit disclose the filter coefficients in forms of:

$$h_{n+1} = h_n + \mu G_n X_n R_{xx}^{-1}(n)[\varphi(|en| \odot \mathrm{sign}(e_n))]$$

In the same field of endeavor, Kim and Efron reference teaches an adaptive scaled non-linearity that is given by:

$$h_{n+1} = h_n + \mu G_n X_n R_{xx}^{-1}(n)[\varphi(|en| \odot \mathrm{sign}(e_n))]$$

(see pp. 1857, right-hand column, paragraph 3 - pp. 1858, right-hand column, paragraph 2) in order to obtain robust power spectral density estimate (see pp. 1866, left-hand column, paragraph 1).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have included within the combination of Romesburg; Oh, Linebarger, Priest, Raghothaman; and Fujii an adaptive scaled non-linearity that is given by the above formula as taught by Kim and Efron since such combination would have obtained robust power spectral density estimate as suggested by Kim and Efron on page 1866, left-hand column, paragraph 1.

Regarding **claim 16**, Romesburg further teaches the echo canceller of claim 15, further comprising a double talk detector connected to the telephone circuit for disabling the update device in response to the detection of double talk on the circuit (see col. 5, line 45-47).

Conclusion

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Makino et al. U.S. Patent No. 6,246,760 discloses a subband echo cancellation method for multichannel audio teleconference and echo canceller using the same.

Liu et al. U.S. Patent No. 6,108,412 discloses an adaptive echo canceling system for telephony application.

Duttweiler, D. C. Proportionate Normalized Least-Mean-Squares Adaptation in Echo Cancelers. IEEE Transactions on Speech and Audio Processing, Vol. 8, No. 5, September 2000, pp. 508-518.

Douglas, S. C. A Family of Normalized LMS Algorithm. IEEE Signal Processing Letters, Vol. 1, No. 3, March 1997, pp. 49-51.

Liu et al. On the Use of a Modified Fast Affine Projection Algorithm in Subband for Acoustic Echo Cancelation. IEEE, Digital Signal Processing Workshop Proceedings, 1996, pp. 354-357.

Tanaka et al. Fast Projection Algorithm and its Step Size Control. ICASSP International Conference. Acoustics, Speech, and Signal Processing, Vol. 2, May 1995, pp. 945-948.

Douglas et al. Normalized Data Nonlinearities for LMS Adaptation. IEEE Transactions on Signal Processing, Vol. 42, No. 6, June 1994, pp. 1352-1365.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Con P. Tran whose telephone number is (703) 305-2341. The examiner can normally be reached on M - F (8:30 AM - 5:00 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Forester W. Isen can be reached on (703) 305-4386. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9314 for regular communications and (703) 872-9314 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Customer Service Office at telephone number (703) 306-0377.

cpt CPT
May 6, 2002

FORESTER W. ISEN
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